SEQUENCE LISTING

<110> Payne, Jewel

   Sick, August

<120> Novel Bacillus thuringiensis Isolate Active Against Lepidopteran Pests,
and Genes Encoding Novel Lepidopteran-Active Toxins

<130> MA-43CDF2D3

<150> US 09/521,344

<151> 2000-03-09

<150> US 08/933,891

<151> 1997-09-19

<150> US 08/356,034

<151> 1994-12-14

<150> US 08/210,110

<151> 1994-03-17

<150> US 07/865,168

<151> 1992-04-09

<150> US 07/451,261

<151> 1989-12-14

<150> US 371,955

<151> 1989-06-27

<160> 8

<170> PatentIn version 3.0

<210> 1

<211> 3528

<212> DNA

<213> Bacillus thuringiensis

<400> 1
atgaataatc agaatcaatg cgttccttat aactgtttga atgatccgac aattgaaata   60

ttagaaggag aaagaataga aactggttac accccaatag atatttcctt gtcgctaacg   120

caatttctgt tgagtgaatt tgtcccaggt gctgggtttg tattaggttt aattgattta   180

atatgggggt ttgtgggtcc ctctcaatgg gatgcatttc ttgtgcaaat tgaacagtta   240

attaaccaaa gaatagagga attcgctagg aaccaagcaa tttctagatt agaagggcta   300

agcaaccttt atcaaattta cgcagaagct tttagagagt gggaagcaga tcctactaat   360

ccagcattaa cagaagagat gcgtattcag ttcaatgaca tgaacagtgc tcttacaacc   420

gctattcctc tttttacagt tcaaaattat caagtacctc ttctatcagt atatgttcaa   480

gctgcaaatt tacatttatc ggttttgaga gatgtttcag tgtttggaca acgttgggga   540

```
tttgatgtag caacaatcaa tagtcgttat aatgatttaa ctaggcttat tggcacctat   600

acagattatg ctgtacgctg gtataatacg ggattagaac gtgtatgggg accggattct   660

agagattggg taaggtataa tcaatttaga agagagctaa cactaactgt attagatatc   720

gtttctctgt tcccgaacta tgatagtaga acgtatccaa ttcgaacagt ttcccaatta   780

actagagaaa tttatacaaa cccagtatta gaaaattttg atggtagttt tcgtggaatg   840

gctcagagaa tagaacagaa tattaggcaa ccacatctta tggatctcct taatagtata   900

accatttata ctgatgtgca tagaggcttt aattattggt caggacatca aataacagct   960

tctcctgtcg gttttgcggg gccagaattt acttttccta gatatggaac catgggaaat  1020

gctgctccac ccgtactgat ctcaactact ggtttgggga tttttagaac attatcttca  1080

cctctttaca gaagaattat acttggttca ggcccaaata atcagaacct gtttgtcctt  1140

gatggaacgg aattttcttt tgcctcccta acagccgatt taccttctac tatatacaga  1200

caaaggggaa cggtcgattc actagatgta ataccgccac aggataatag tgtgccagca  1260

cgtgcgggat ttagtcatcg attaagtcat gttacaatgc tgagccaagc agctggagca  1320

gtttacacct tgagagctcc aacgttttct tggcgacatc gtagtgctga attctctaac  1380

ctaattcctt catcacaaat cacacagata cctttaacaa agtctattaa tcttggctct  1440

gggacctctg ttgttaaagg accaggattt acaggaggag atattcttcg aataacttca  1500

cctggccaga tttcaacctt aagagtgact attacggcac cattatcaca aagatatcgc  1560

gtaagaattc gctacgcttc tactacaaat ttacaattcc atacatcaat tgacggaaga  1620

cctattaatc aggggaattt ttcagcaact atgagtagtg ggggtaattt acagtccgga  1680

agctttagga ctgcaggttt tactactccg tttaactttt caaatggatc aagtatattt  1740

acgttaagtg ctcatgtctt caattcaggc aatgaagttt atatagagcg aattgaattt  1800

gttccggcag aagtaacatt tgaggcggaa tatgatttag aaagagcgca agaggcggtg  1860

aatgctctgt ttacttcttc caatcaacta ggattaaaaa caaatgtgac ggactatcat  1920

attgatcaag tgtccaatct agtcgaatgt ttatccggtg aattctgtct ggatgaaaag  1980

agagaattgt ccgagaaagt caaacatgcg aaccgactca gtgatgagcg gaatttactt  2040
```

```
caagacccaa acttcagagg catcaataga caaccagacc gtggctggag aggcagtacg    2100

gatattacca tccaaggagg agatgacgta ttcaaagaga attacgtcac actaccgggt    2160

acctttaatg agtgttatcc tacgtatctg tatcaaaaaa tagatgagtc gaaattaaaa    2220

gcctataccc gttaccaatt aagagggtac atcgaggata gtcaacactt agaaatctat    2280

ttaattcgct acaatacaaa acacgaaaca gtaaatgtgc caggtacggg ttccttatgg    2340

ccgctttcag tcgaaaatcc aattggaaag tgcggagaac caaatcgatg cgcaccacaa    2400

cttgaatgga atcctgatct agattgttcc tgcagagacg gggaaaaatg tgcacatcac    2460

tcccatcatt tctccttgga cattgatatt ggatgtacag atttaaatga gaacttaggt    2520

gtatgggtga tattcaaaat taagatgcaa gatggtcacg caagactagg taatctagag    2580

tttctcgaag agaaaccatt agtaggcgaa tcgttagcac gcgtgaagag agcggagaag    2640

aagtggagag acaaacgaga gaaattgcaa gtggaaacaa atatcgttta taaagaggca    2700

aaagaatctg tagatgcttt atttgtgaac tctcaatatg atagattaca agcggatacc    2760

gacatcgcga tgattcatgc ggcagataaa cgcgttcatc gaattcgaga agcatatctt    2820

ccagagttat ctgtaattcc gggtgtcaat gcgggcattt ttgaagaatt agagggacgt    2880

attttcacag cctactcttt atatgatgcg agaaatgtca ttaaaaatgg cgatttcaat    2940

aatggcttat catgctggaa cgtgaaaggg catgtagatg tagaagaaca aaacaaccac    3000

cgttcggttc ttgttgtccc ggaatgggaa gcagaggtgt cacaagaggt tcgtgtctgt    3060

ccaggtcgtg gctatatcct acgtgttaca gcgtacaaag agggatatgg agaaggttgc    3120

gtaacgattc atgagatcga agacaataca gacgaactga aattcagcaa ctgtgtagaa    3180

gaggaagtat atccaaacaa cacggtaacg tgtaatgatt atactgcaaa tcaagaagaa    3240

tacgggggtg cgtacacttc tcgtaatcgt ggatatggtg aatcttatga aagtaattct    3300

tccataccag ctgagtatgc gccagtttat gaggaagcat atatagatgg aagaaaagag    3360

aatccttgtg aatctaacag aggatatggg gattacacgc cactaccagc tggttatgtg    3420

acaaaagaat tagagtactt cccagaaacc gataaggtat ggattgagat cggggaaacg    3480

gaaggaacat tcatcgtgga tagcgtggaa ttactcctta tggaggaa                 3528
```

<210> 2

<211> 1176

<212> PRT

<213> Bacillus thuringiensis

<400> 2

```
Met Asn Asn Gln Asn Gln Cys Val Pro Tyr Asn Cys Leu Asn Asp Pro
1               5                   10                  15

Thr Ile Glu Ile Leu Glu Gly Glu Arg Ile Glu Thr Gly Tyr Thr Pro
            20                  25                  30

Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser Glu Phe Val
        35                  40                  45

Pro Gly Ala Gly Phe Val Leu Gly Leu Ile Asp Leu Ile Trp Gly Phe
    50                  55                  60

Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu Gln Leu
65                  70                  75                  80

Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala Ile Ser Arg
                85                  90                  95

Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu Ala Phe Arg
            100                 105                 110

Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Thr Glu Glu Met Arg
            115                 120                 125

Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala Ile Pro Leu
    130                 135                 140

Phe Thr Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val Tyr Val Gln
145                 150                 155                 160

Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser Val Phe Gly
                165                 170                 175

Gln Arg Trp Gly Phe Asp Val Ala Thr Ile Asn Ser Arg Tyr Asn Asp
            180                 185                 190
```

```
Leu Thr Arg Leu Ile Gly Thr Tyr Thr Asp Tyr Ala Val Arg Trp Tyr
        195             200             205

Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg Asp Trp Val
        210             215             220

Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val Leu Asp Ile
225             230             235             240

Val Ser Leu Phe Pro Asn Tyr Asp Ser Arg Thr Tyr Pro Ile Arg Thr
            245             250             255

Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val Leu Glu Asn
        260             265             270

Phe Asp Gly Ser Phe Arg Gly Met Ala Gln Arg Ile Glu Gln Asn Ile
        275             280             285

Arg Gln Pro His Leu Met Asp Leu Leu Asn Ser Ile Thr Ile Tyr Thr
    290             295             300

Asp Val His Arg Gly Phe Asn Tyr Trp Ser Gly His Gln Ile Thr Ala
305             310             315             320

Ser Pro Val Gly Phe Ala Gly Pro Glu Phe Thr Phe Pro Arg Tyr Gly
            325             330             335

Thr Met Gly Asn Ala Ala Pro Pro Val Leu Ile Ser Thr Thr Gly Leu
        340             345             350

Gly Ile Phe Arg Thr Leu Ser Ser Pro Leu Tyr Arg Arg Ile Ile Leu
        355             360             365

Gly Ser Gly Pro Asn Asn Gln Asn Leu Phe Val Leu Asp Gly Thr Glu
    370             375             380

Phe Ser Phe Ala Ser Leu Thr Ala Asp Leu Pro Ser Thr Ile Tyr Arg
385             390             395             400

Gln Arg Gly Thr Val Asp Ser Leu Asp Val Ile Pro Pro Gln Asp Asn
            405             410             415

Ser Val Pro Ala Arg Ala Gly Phe Ser His Arg Leu Ser His Val Thr
            420             425             430

Met Leu Ser Gln Ala Ala Gly Ala Val Tyr Thr Leu Arg Ala Pro Thr
        435             440             445
```

```
Phe Ser Trp Arg His Arg Ser Ala Glu Phe Ser Asn Leu Ile Pro Ser
    450             455             460
```

```
Ser Gln Ile Thr Gln Ile Pro Leu Thr Lys Ser Ile Asn Leu Gly Ser
465             470             475             480
```

```
Gly Thr Ser Val Val Lys Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
            485             490             495
```

```
Arg Ile Thr Ser Pro Gly Gln Ile Ser Thr Leu Arg Val Thr Ile Thr
        500             505             510
```

```
Ala Pro Leu Ser Gln Arg Tyr Arg Val Arg Ile Arg Tyr Ala Ser Thr
        515             520             525
```

```
Thr Asn Leu Gln Phe His Thr Ser Ile Asp Gly Arg Pro Ile Asn Gln
    530             535             540
```

```
Gly Asn Phe Ser Ala Thr Met Ser Ser Gly Gly Asn Leu Gln Ser Gly
545             550             555             560
```

```
Ser Phe Arg Thr Ala Gly Phe Thr Thr Pro Phe Asn Phe Ser Asn Gly
            565             570             575
```

```
Ser Ser Ile Phe Thr Leu Ser Ala His Val Phe Asn Ser Gly Asn Glu
            580             585             590
```

```
Val Tyr Ile Glu Arg Ile Glu Phe Val Pro Ala Glu Val Thr Phe Glu
        595             600             605
```

```
Ala Glu Tyr Asp Leu Glu Arg Ala Gln Glu Ala Val Asn Ala Leu Phe
    610             615             620
```

```
Thr Ser Ser Asn Gln Leu Gly Leu Lys Thr Asn Val Thr Asp Tyr His
625             630             635             640
```

```
Ile Asp Gln Val Ser Asn Leu Val Glu Cys Leu Ser Gly Glu Phe Cys
            645             650             655
```

```
Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys His Ala Asn Arg
            660             665             670
```

```
Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile
        675             680             685
```

```
Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile
    690             695             700
```

Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly
705   710   715   720

Thr Phe Asn Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu
            725   730   735

Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg Gly Tyr Ile Glu
            740   745   750

Asp Ser Gln His Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Thr Lys His
            755   760   765

Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Val
            770   775   780

Glu Asn Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro Gln
785   790   795   800

Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys
            805   810   815

Cys Ala His His Ser His His Phe Ser Leu Asp Ile Asp Ile Gly Cys
            820   825   830

Thr Asp Leu Asn Glu Asn Leu Gly Val Trp Val Ile Phe Lys Ile Lys
            835   840   845

Met Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu
            850   855   860

Lys Pro Leu Val Gly Glu Ser Leu Ala Arg Val Lys Arg Ala Glu Lys
865   870   875   880

Lys Trp Arg Asp Lys Arg Glu Lys Leu Gln Val Glu Thr Asn Ile Val
            885   890   895

Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln
            900   905   910

Tyr Asp Arg Leu Gln Ala Asp Thr Asp Ile Ala Met Ile His Ala Ala
            915   920   925

Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser
930   935   940

Val Ile Pro Gly Val Asn Ala Gly Ile Phe Glu Glu Leu Glu Gly Arg
945   950   955   960

```
Ile Phe Thr Ala Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn
            965                 970                 975

Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val Lys Gly His Val
            980                 985                 990

Asp Val Glu Glu Gln Asn Asn His  Arg Ser Val Leu Val  Val Pro Glu
            995                 1000                1005

Trp Glu  Ala Glu Val Ser Gln  Glu Val Arg Val Cys  Pro Gly Arg
    1010                1015                1020

Gly Tyr  Ile Leu Arg Val Thr  Ala Tyr Lys Glu Gly  Tyr Gly Glu
    1025                1030                1035

Gly Cys  Val Thr Ile His Glu  Ile Glu Asp Asn Thr  Asp Glu Leu
    1040                1045                1050

Lys Phe  Ser Asn Cys Val Glu  Glu Glu Val Tyr Pro  Asn Asn Thr
    1055                1060                1065

Val Thr  Cys Asn Asp Tyr Thr  Ala Asn Gln Glu Glu  Tyr Gly Gly
    1070                1075                1080

Ala Tyr  Thr Ser Arg Asn Arg  Gly Tyr Gly Glu Ser  Tyr Glu Ser
    1085                1090                1095

Asn Ser  Ser Ile Pro Ala Glu  Tyr Ala Pro Val Tyr  Glu Glu Ala
    1100                1105                1110

Tyr Ile  Asp Gly Arg Lys Glu  Asn Pro Cys Glu Ser  Asn Arg Gly
    1115                1120                1125

Tyr Gly  Asp Tyr Thr Pro Leu  Pro Ala Gly Tyr Val  Thr Lys Glu
    1130                1135                1140

Leu Glu  Tyr Phe Pro Glu Thr  Asp Lys Val Trp Ile  Glu Ile Gly
    1145                1150                1155

Glu Thr  Glu Gly Thr Phe Ile  Val Asp Ser Val Glu  Leu Leu Leu
    1160                1165                1170

Met Glu  Glu
    1175
```

<210> 3

<211> 3495

<212>   DNA

<213>   Bacillus thuringiensis

<400>   3
atggaaataa ataatcaaaa ccaatgtgtg ccttacaatt gtttaagtaa tcctaaggag   60

ataatattag gcgaggaaag gctagaaaca gggaatactg tagcagacat ttcattaggg   120

cttattaatt ttctatattc taattttgta ccaggaggag gatttatagt aggtttacta   180

gaattaatat ggggatttat agggccttcg caatgggata ttttttttagc tcaaattgag   240

caattgatta gtcaaagaat agaagaattt gctaggaatc aggcaatttc aagattggag   300

gggctaagca atctttataa ggtctatgtt agagcgttta gcgactggga gaaagatcct   360

actaatcctg ctttaaggga agaaatgcgt atacaattta atgacatgaa tagtgctctc   420

ataacggcta ttccactttt tagagttcaa aattatgaag ttgctctttt atctgtatat   480

gttcaagccg caaacttaca tttatctatt ttaagggatg tttcagtttt cggagaaaga   540

tggggatatg atacagcgac tatcaataat cgctatagtg atctgactag ccttattcat   600

gtttatacta accattgtgt ggatacgtat aatcagggat taaggcgttt ggaaggtcgt   660

tttcttagcg attggattgt atataatcgt ttccggagac aattgacaat ttcagtatta   720

gatattgttg cgttttttcc aaattatgat attagaacat atccaattca aacagctact   780

cagctaacga gggaagtcta tctggattta cctttttatta atgaaaatct ttctcctgca   840

gcaagctatc caacctttttc agctgctgaa agtgctataa ttagaagtcc tcatttagta   900

gactttttaa atagctttac catttataca gatagtctgg cacgttatgc atattgggga   960

gggcacttgg taaattcttt ccgcacagga accactacta atttgataag atcccccttta   1020

tatggaaggg aaggaaatac agagcgcccc gtaactatta ccgcatcacc tagcgtacca   1080

atatttagaa cactttcata tattacaggc cttgacaatt caaatcctgt agctggaatc   1140

gagggagtgg aattccaaaa tactataagt agaagtatct atcgtaaaag cggtccaata   1200

gattctttta gtgaattacc acctcaagat gccagcgtat ctcctgcaat tgggtatagt   1260

```
caccgtttat gccatgcaac atttttagaa cggattagtg gaccaagaat agcaggcacc   1320

gtattttctt ggacacaccg tagtgccagc cctactaatg aagtaagtcc atctagaatt   1380

acacaaattc catgggtaaa ggcgcatact cttgcatctg gtgcctccgt cattaaaggt   1440

cctggatttta caggtggaga tattctgact aggaatagta tgggcgagct ggggacctta   1500

cgagtaacct tcacaggaag attaccacaa agttattata tacgtttccg ttatgcttcg   1560

gtagcaaata ggagtggtac atttagatat tcacagccac cttcgtatgg aatttcattt   1620

ccaaaaacta tggacgcagg tgaaccacta acatctcgtt cgttcgctca tacaacactc   1680

ttcactccaa taaccttttc acgagctcaa gaagaatttg atctatacat ccaatcgggt   1740

gtttatatag atcgaattga atttataccg gttactgcaa catttgaggc agaatatgat   1800

ttagaaagag cgcaaaaggt ggtgaatgcc ctgtttacgt ctacaaacca actagggcta   1860

aaaacagatg tgacggatta tcatattgat caggtatcca atctagttgc gtgtttatcg   1920

gatgaatttt gtctggatga aaagagagaa ttgtccgaga aagttaaaca tgcaaagcga   1980

ctcagtgatg agcggaattt acttcaagat ccaaacttca gagggatcaa taggcaacca   2040

gaccgtggct ggagaggaag tacggatatt actatccaag gaggagatga cgtattcaaa   2100

gagaattacg ttacgctacc gggtaccttt gatgagtgct atccaacgta tttatatcaa   2160

aaaatagatg agtcgaaatt aaaagcctat acccgttatc aattaagagg gtatatcgaa   2220

gatagtcaag acttagaaat ctatttaatt cgttacaatg caaaacacga aatagtaaat   2280

gtaccaggta caggaagttt atggcctctt tctgtagaaa atcaaattgg accttgtgga   2340

gaaccgaatc gatgcgcgcc acaccttgaa tggaatcctg atttacactg ttcctgcaga   2400

gacggggaaa aatgtgcaca tcattctcat catttctctt tggacattga tgttggatgt   2460

acagacttaa atgaggactt aggtgtatgg gtgatattca agattaagac gcaagatggc   2520

cacgcacgac tagggaatct agagtttctc gaagagaaac cattattagg agaagcacta   2580

gctcgtgtga aaagagcgga gaaaaaatgg agagacaaac gcgaaacatt acaattggaa   2640

acaactatcg tttataaaga ggcaaaagaa tctgtagatg ctttatttgt aaactctcaa   2700

tatgatagat tacaagcgga tacgaacatc gcgatgattc atgcggcaga taaacgcgtt   2760
```

```
catagaattc gagaagcgta tctgccggag ctgtctgtga ttccgggtgt caatgcggct   2820

atttttgaag aattagaaga gcgtattttc actgcatttt ccctatatga tgcgagaaat   2880

attattaaaa atggcgattt caataatggc ttattatgct ggaacgtgaa agggcatgta   2940

gaggtagaag aacaaaacaa tcaccgttca gtcctggtta tcccagaatg ggaggcagaa   3000

gtgtcacaag aggttcgtgt ctgtccaggt cgtggctata tccttcgtgt tacagcgtac   3060

aaagagggat atggagaagg ttgcgtaacg atccatgaga tcgagaacaa tacagacgaa   3120

ctgaaattca caactgtgt agaagaggaa gtatatccaa acaacacggt aacgtgtatt    3180

aattatactg cgactcaaga agaatatgag ggtacgtaca cttctcgtaa tcgaggatat   3240

gacgaagcct atggtaataa cccttccgta ccagctgatt atgcgtcagt ctatgaagaa   3300

aaatcgtata cagatagacg aagagagaat ccttgtgaat ctaacagagg atatggagat   3360

tacacaccac taccagctgg ttatgtaaca aaggaattag agtacttccc agagaccgat   3420

aaggtatgga ttgagattgg agaaacagaa ggaacattca tcgtggacag cgtggaatta   3480

ctccttatgg aggaa                                                    3495
```

<210>   4

<211>   1165

<212>   PRT

<213>   Bacillus thuringiensis

<400>   4

```
Met Glu Ile Asn Asn Gln Asn Gln Cys Val Pro Tyr Asn Cys Leu Ser
1               5                   10                  15

Asn Pro Lys Glu Ile Ile Leu Gly Glu Glu Arg Leu Glu Thr Gly Asn
            20                  25                  30

Thr Val Ala Asp Ile Ser Leu Gly Leu Ile Asn Phe Leu Tyr Ser Asn
            35                  40                  45
```

```
Phe Val Pro Gly Gly Gly Phe Ile Val Gly Leu Leu Glu Leu Ile Trp
    50                  55              60

Gly Phe Ile Gly Pro Ser Gln Trp Asp Ile Phe Leu Ala Gln Ile Glu
65                  70              75                  80

Gln Leu Ile Ser Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala Ile
                85                  90                  95

Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Lys Val Tyr Val Arg Ala
            100             105             110

Phe Ser Asp Trp Glu Lys Asp Pro Thr Asn Pro Ala Leu Arg Glu Glu
            115             120             125

Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Ile Thr Ala Ile
    130             135             140

Pro Leu Phe Arg Val Gln Asn Tyr Glu Val Ala Leu Leu Ser Val Tyr
145             150             155             160

Val Gln Ala Ala Asn Leu His Leu Ser Ile Leu Arg Asp Val Ser Val
            165             170             175

Phe Gly Glu Arg Trp Gly Tyr Asp Thr Ala Thr Ile Asn Asn Arg Tyr
            180             185             190

Ser Asp Leu Thr Ser Leu Ile His Val Tyr Thr Asn His Cys Val Asp
            195             200             205

Thr Tyr Asn Gln Gly Leu Arg Arg Leu Glu Gly Arg Phe Leu Ser Asp
    210             215             220

Trp Ile Val Tyr Asn Arg Phe Arg Arg Gln Leu Thr Ile Ser Val Leu
225             230             235             240

Asp Ile Val Ala Phe Phe Pro Asn Tyr Asp Ile Arg Thr Tyr Pro Ile
            245             250             255

Gln Thr Ala Thr Gln Leu Thr Arg Glu Val Tyr Leu Asp Leu Pro Phe
            260             265             270

Ile Asn Glu Asn Leu Ser Pro Ala Ala Ser Tyr Pro Thr Phe Ser Ala
            275             280             285

Ala Glu Ser Ala Ile Ile Arg Ser Pro His Leu Val Asp Phe Leu Asn
    290             295             300
```

Ser Phe Thr Ile Tyr Thr Asp Ser Leu Ala Arg Tyr Ala Tyr Trp Gly
305   310   315   320

Gly His Leu Val Asn Ser Phe Arg Thr Gly Thr Thr Thr Asn Leu Ile
325   330   335

Arg Ser Pro Leu Tyr Gly Arg Glu Gly Asn Thr Glu Arg Pro Val Thr
340   345   350

Ile Thr Ala Ser Pro Ser Val Pro Ile Phe Arg Thr Leu Ser Tyr Ile
355   360   365

Thr Gly Leu Asp Asn Ser Asn Pro Val Ala Gly Ile Glu Gly Val Glu
370   375   380

Phe Gln Asn Thr Ile Ser Arg Ser Ile Tyr Arg Lys Ser Gly Pro Ile
385   390   395   400

Asp Ser Phe Ser Glu Leu Pro Pro Gln Asp Ala Ser Val Ser Pro Ala
405   410   415

Ile Gly Tyr Ser His Arg Leu Cys His Ala Thr Phe Leu Glu Arg Ile
420   425   430

Ser Gly Pro Arg Ile Ala Gly Thr Val Phe Ser Trp Thr His Arg Ser
435   440   445

Ala Ser Pro Thr Asn Glu Val Ser Pro Ser Arg Ile Thr Gln Ile Pro
450   455   460

Trp Val Lys Ala His Thr Leu Ala Ser Gly Ala Ser Val Ile Lys Gly
465   470   475   480

Pro Gly Phe Thr Gly Gly Asp Ile Leu Thr Arg Asn Ser Met Gly Glu
485   490   495

Leu Gly Thr Leu Arg Val Thr Phe Thr Gly Arg Leu Pro Gln Ser Tyr
500   505   510

Tyr Ile Arg Phe Arg Tyr Ala Ser Val Ala Asn Arg Ser Gly Thr Phe
515   520   525

Arg Tyr Ser Gln Pro Pro Ser Tyr Gly Ile Ser Phe Pro Lys Thr Met
530   535   540

Asp Ala Gly Glu Pro Leu Thr Ser Arg Ser Phe Ala His Thr Thr Leu
545   550   555   560

```
Phe Thr Pro Ile Thr Phe Ser Arg Ala Gln Glu Glu Phe Asp Leu Tyr
            565             570              575

Ile Gln Ser Gly Val Tyr Ile Asp Arg Ile Glu Phe Ile Pro Val Thr
            580             585             590

Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Val Val
        595             600             605

Asn Ala Leu Phe Thr Ser Thr Asn Gln Leu Gly Leu Lys Thr Asp Val
    610             615             620

Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Ala Cys Leu Ser
625             630             635             640

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys
            645             650             655

His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn
            660             665             670

Phe Arg Gly Ile Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr
            675             680             685

Asp Ile Thr Ile Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val
    690             695             700

Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln
705             710             715             720

Lys Ile Asp Glu Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg
            725             730             735

Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr
            740             745             750

Asn Ala Lys His Glu Ile Val Asn Val Pro Gly Thr Gly Ser Leu Trp
            755             760             765

Pro Leu Ser Val Glu Asn Gln Ile Gly Pro Cys Gly Glu Pro Asn Arg
    770             775             780

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu His Cys Ser Cys Arg
785             790             795             800

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile
            805             810             815
```

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile
        820   825   830

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu
        835   840   845

Phe Leu Glu Glu Lys Pro Leu Leu Gly Glu Ala Leu Ala Arg Val Lys
    850   855   860

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Thr Leu Gln Leu Glu
865   870   875   880

Thr Thr Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe
        885   890   895

Val Asn Ser Gln Tyr Asp Arg Leu Gln Ala Asp Thr Asn Ile Ala Met
        900   905   910

Ile His Ala Ala Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu
        915   920   925

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu
    930   935   940

Leu Glu Glu Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn
945   950   955   960

Ile Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Leu Cys Trp Asn Val
        965   970   975

Lys Gly His Val Glu Val Glu Glu Gln Asn Asn His Arg Ser Val Leu
        980   985   990

Val Ile Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val Cys
    995   1000   1005

Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu Gly
    1010   1015   1020

Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn Thr
    1025   1030   1035

Asp Glu Leu Lys Phe Asn Asn Cys Val Glu Glu Glu Val Tyr Pro
    1040   1045   1050

Asn Asn Thr Val Thr Cys Ile Asn Tyr Thr Ala Thr Gln Glu Glu
    1055   1060   1065

```
Tyr Glu  Gly Thr Tyr Thr Ser  Arg Asn Arg Gly Tyr  Asp Glu Ala
    1070                1075               1080

Tyr Gly  Asn Asn Pro Ser Val  Pro Ala Asp Tyr Ala  Ser Val Tyr
    1085                1090               1095

Glu Glu  Lys Ser Tyr Thr Asp  Arg Arg Arg Glu Asn  Pro Cys Glu
    1100                1105               1110

Ser Asn  Arg Gly Tyr Gly Asp  Tyr Thr Pro Leu Pro  Ala Gly Tyr
    1115                1120               1125

Val Thr  Lys Glu Leu Glu Tyr  Phe Pro Glu Thr Asp  Lys Val Trp
    1130                1135               1140

Ile Glu  Ile Gly Glu Thr Glu  Gly Thr Phe Ile Val  Asp Ser Val
    1145                1150               1155

Glu Leu  Leu Leu Met Glu Glu
    1160                1165
```

<210> 5

<211> 3567

<212> DNA

<213> Bacillus thuringiensis

<400> 5
```
atggaggaaa ataatcaaaa tcaatgcata ccttacaatt gtttaagtaa tcctgaagaa     60

gtacttttgg atggagaacg gatatcaact ggtaattcat caattgatat ttctctgtca    120

cttgttcagt ttctggtatc taactttgta ccagggggag gattttagt tggattaata     180

gattttgtat ggggaatagt tggcccttct caatgggatg catttctagt acaaattgaa    240

caattaatta atgaaagaat agctgaattt gctaggaatg ctgctattgc taatttagaa    300

ggattaggaa acaatttcaa tatatatgtg gaagcattta agaatgggga agaagatcct    360

aataatccag caaccaggac cagagtaatt gatcgctttc gtatacttga tgggctactt    420

gaaagggaca ttccttcgtt tcgaatttct ggatttgaag taccccttttat atccgtttat    480

gctcaagcgg ccaatctgca tctagctata ttaagagatt ctgtaatttt tggagaaaga    540
```

```
tggggattga caacgataaa tgtcaatgaa aactataata gactaattag gcatattgat    600

gaatatgctg atcactgtgc aaatacgtat aatcggggat taaataattt accgaaatct    660

acgtatcaag attggataac atataatcga ttacggagag acttaacatt gactgtatta    720

gatatcgccg ctttctttcc aaactatgac aataggagat atccaattca gccagttggt    780

caactaacaa gggaagttta tacggaccca ttaattaatt ttaatccaca gttacagtct    840

gtagctcaat tacctacttt taacgttatg gagagcagcg caattagaaa tcctcattta    900

tttgatatat tgaataatct tacaatcttt acggattggt ttagtgttgg acgcaatttt    960

tattggggag gacatcgagt aatatctagc cttataggag gtggtaacat aacatctcct   1020

atatatggaa gagaggcgaa ccaggagcct ccaagatcct ttacttttaa tggaccggta   1080

tttaggactt tatcaaatcc tactttacga ttattacagc aaccttggcc agcgccacca   1140

tttaatttac gtggtgttga aggagtagaa ttttctacac ctacaaatag ctttacgtat   1200

cgaggaagag gtcaggttga ttctttaact gaattaccgc ctgaggataa tagtgtgcca   1260

cctcgcgaag gatatagtca tcgtttatgt catgcaactt ttgttcaaag atctggaaca   1320

ccttttttaa caactggtgt agtattttct tggacgcatc gtagtgcaac tcttacaaat   1380

acaattgatc cagagagaat taatcaaata cctttagtga aaggatttag agtttggggg   1440

ggcacctctg tcattacagg accaggattt acaggagggg atatccttcg aagaaatacc   1500

tttggtgatt ttgtatctct acaagtcaat attaattcac caattaccca aagataccgt   1560

ttaagatttc gttacgcttc cagtagggat gcacgagtta tagtattaac aggagcggca   1620

tccacaggag tgggaggcca agttagtgta aatatgcctc ttcagaaaac tatggaaata   1680

ggggagaact aacatctag aacatttaga tataccgatt ttagtaatcc tttttcattt   1740

agagctaatc cagatataat tgggataagt gaacaacctc tatttggtgc aggttctatt   1800

agtagcggtg aactttatat agataaaatt gaaattattc tagcagatgc aacatttgaa   1860

gcagaatctg atttagaaag agcacaaaag gcggtgaatg ccctgtttac ttcttccaat   1920

caaatcgggt taaaaaccga tgtgacggat tatcatattg atcaagtatc caatttagtg   1980

gattgtttat cagatgaatt ttgtctggat gaaaagcgag aattgtccga gaaagtcaaa   2040
```

```
catgcgaagc gactcagtga tgagcggaat ttacttcaag atccaaactt cagagggatc   2100

aatagacaac cagaccgtgg ctggagagga agtacagata ttaccatcca aggaggagat   2160

gacgtattca aagagaatta cgtcacacta ccgggtaccg ttgatgagtg ctatccaacg   2220

tatttatatc agaaaataga tgagtcgaaa ttaaaagctt atacccgtta tgaattaaga   2280

gggtatatcg aagatagtca agacttagaa atctatttga tccgttacaa tgcaaaacac   2340

gaaatagtaa atgtgccagg cacgggttcc ttatggccgc tttcagccca aagtccaatc   2400

ggaaagtgtg gagaaccgaa tcgatgcgcg ccacaccttg aatggaatcc tgatctagat   2460

tgttcctgca gagacgggga aaaatgtgca catcattccc atcatttcac cttggatatt   2520

gatgttggat gtacagactt aaatgaggac ttaggtctat gggtgatatt caagattaag   2580

acgcaagata accatgcaag actagggaat ctagagtttc tcgaagagaa accattatta   2640

ggggaagcac tagctcgtgt gaaaagagcg gagaagaagt ggagagacaa acgagagaaa   2700

ctgcagttgg aaacaaatat tgtttataaa gaggcaaaag aatctgtaga tgctttattt   2760

gtaaactctc aatatgatag attacaagtg aatacgaaca tcgcaatgat tcatgcggca   2820

gataaacgcg ttcatagaat ccgggaagcg tatctgccag agttgtctgt gattccaggt   2880

gtcaatgcgg ccattttcga agaattagag ggacgtattt ttacagcgta ttccttatat   2940

gatgcgagaa atgtcattaa aaatggcgat ttcaataatg gcttattatg ctggaacgtg   3000

aaaggtcatg tagatgtaga agagcaaaac aaccaccgtt cggtccttgt tatcccagaa   3060

tgggaggcag aagtgtcaca agaggttcgt gtctgtccag gtcgtggcta tatccttcgt   3120

gtcacagcat ataaagaggg atatggagag ggctgcgtaa cgatccatga gatcgaagac   3180

aatacagacg aactgaaatt cagcaactgt gtagaagagg aagtatatcc aaacaacaca   3240

gtaacgtgta ataattatac tgggactcaa gaagaatatg agggtacgta cacttctcgt   3300

aatcaaggat atgacgaagc ctatggtaat aacccttccg taccagctga ttacgcttca   3360

gtctatgaag aaaaatcgta tacagatgga cgaagagaga atccttgtga atctaacaga   3420

ggctatgggg attacacacc actaccggct ggttatgtaa caaaggattt agagtacttc   3480

ccagagaccg ataaggtatg gattgagatc ggagaaacag aaggaacatt catcgtggat   3540
```

agcgtggaat tactccttat ggaggaa   3567

<210> 6

<211> 1189

<212> PRT

<213> Bacillus thuringiensis

<400> 6

```
Met Glu Glu Asn Asn Gln Asn Gln Cys Ile Pro Tyr Asn Cys Leu Ser
1               5                   10                  15

Asn Pro Glu Glu Val Leu Leu Asp Gly Glu Arg Ile Ser Thr Gly Asn
            20                  25                  30

Ser Ser Ile Asp Ile Ser Leu Ser Leu Val Gln Phe Leu Val Ser Asn
            35                  40                  45

Phe Val Pro Gly Gly Gly Phe Leu Val Gly Leu Ile Asp Phe Val Trp
        50                  55                  60

Gly Ile Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu
65                  70                  75                  80

Gln Leu Ile Asn Glu Arg Ile Ala Glu Phe Ala Arg Asn Ala Ala Ile
                85                  90                  95

Ala Asn Leu Glu Gly Leu Gly Asn Asn Phe Asn Ile Tyr Val Glu Ala
            100                 105                 110

Phe Lys Glu Trp Glu Glu Asp Pro Asn Asn Pro Ala Thr Arg Thr Arg
            115                 120                 125

Val Ile Asp Arg Phe Arg Ile Leu Asp Gly Leu Leu Glu Arg Asp Ile
    130                 135                 140

Pro Ser Phe Arg Ile Ser Gly Phe Glu Val Pro Leu Leu Ser Val Tyr
145                 150                 155                 160

Ala Gln Ala Ala Asn Leu His Leu Ala Ile Leu Arg Asp Ser Val Ile
                165                 170                 175
```

Phe Gly Glu Arg Trp Gly Leu Thr Thr Ile Asn Val Asn Glu Asn Tyr
      180   185   190

Asn Arg Leu Ile Arg His Ile Asp Glu Tyr Ala Asp His Cys Ala Asn
      195   200   205

Thr Tyr Asn Arg Gly Leu Asn Asn Leu Pro Lys Ser Thr Tyr Gln Asp
      210   215   220

Trp Ile Thr Tyr Asn Arg Leu Arg Arg Asp Leu Thr Leu Thr Val Leu
225   230   235   240

Asp Ile Ala Ala Phe Phe Pro Asn Tyr Asp Asn Arg Arg Tyr Pro Ile
          245   250   255

Gln Pro Val Gly Gln Leu Thr Arg Glu Val Tyr Thr Asp Pro Leu Ile
        260   265   270

Asn Phe Asn Pro Gln Leu Gln Ser Val Ala Gln Leu Pro Thr Phe Asn
        275   280   285

Val Met Glu Ser Ser Ala Ile Arg Asn Pro His Leu Phe Asp Ile Leu
      290   295   300

Asn Asn Leu Thr Ile Phe Thr Asp Trp Phe Ser Val Gly Arg Asn Phe
305   310   315   320

Tyr Trp Gly Gly His Arg Val Ile Ser Ser Leu Ile Gly Gly Gly Asn
        325   330   335

Ile Thr Ser Pro Ile Tyr Gly Arg Glu Ala Asn Gln Glu Pro Pro Arg
        340   345   350

Ser Phe Thr Phe Asn Gly Pro Val Phe Arg Thr Leu Ser Asn Pro Thr
      355   360   365

Leu Arg Leu Leu Gln Gln Pro Trp Pro Ala Pro Pro Phe Asn Leu Arg
      370   375   380

Gly Val Glu Gly Val Glu Phe Ser Thr Pro Thr Asn Ser Phe Thr Tyr
385   390   395   400

Arg Gly Arg Gly Gln Val Asp Ser Leu Thr Glu Leu Pro Pro Glu Asp
        405   410   415

Asn Ser Val Pro Pro Arg Glu Gly Tyr Ser His Arg Leu Cys His Ala
        420   425   430

Thr Phe Val Gln Arg Ser Gly Thr Pro Phe Leu Thr Thr Gly Val Val
    435   440   445

Phe Ser Trp Thr His Arg Ser Ala Thr Leu Thr Asn Thr Ile Asp Pro
    450   455   460

Glu Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe Arg Val Trp Gly
465   470   475   480

Gly Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu
             485   490   495

Arg Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln Val Asn Ile Asn
         500   505   510

Ser Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg Tyr Ala Ser Ser
      515   520   525

Arg Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala Ser Thr Gly Val
    530   535   540

Gly Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys Thr Met Glu Ile
545   550   555   560

Gly Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr Asp Phe Ser Asn
             565   570   575

Pro Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly Ile Ser Glu Gln
         580   585   590

Pro Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu Leu Tyr Ile Asp
      595   600   605

Lys Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu Ala Glu Ser Asp
    610   615   620

Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ser Asn
625   630   635   640

Gln Ile Gly Leu Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln Val
         645   650   655

Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys
         660   665   670

Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu
      675   680   685

Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro
690 695 700

Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp
705 710 715 720

Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Val Asp Glu
725 730 735

Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys
740 745 750

Ala Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp
755 760 765

Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn
770 775 780

Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala Gln Ser Pro Ile
785 790 795 800

Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn
805 810 815

Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His
820 825 830

Ser His His Phe Thr Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn
835 840 845

Glu Asp Leu Gly Leu Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Asn
850 855 860

His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu
865 870 875 880

Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp
885 890 895

Lys Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val Tyr Lys Glu Ala
900 905 910

Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Arg Leu
915 920 925

Gln Val Asn Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val
930 935 940

```
His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly
945                 950                 955                 960

Val Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg Ile Phe Thr Ala
                965                 970                 975

Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe Asn
                980                 985                 990

Asn Gly Leu Leu Cys Trp Asn Val  Lys Gly His Val Asp  Val Glu Glu
        995                 1000                1005

Gln Asn  Asn His Arg Ser Val  Leu Val Ile Pro Glu  Trp Glu Ala
    1010                1015                1020

Glu Val  Ser Gln Glu Val Arg  Val Cys Pro Gly Arg  Gly Tyr Ile
    1025                1030                1035

Leu Arg  Val Thr Ala Tyr Lys  Glu Gly Tyr Gly Glu  Gly Cys Val
    1040                1045                1050

Thr Ile  His Glu Ile Glu Asp  Asn Thr Asp Glu Leu  Lys Phe Ser
    1055                1060                1065

Asn Cys  Val Glu Glu Glu Val  Tyr Pro Asn Asn Thr  Val Thr Cys
    1070                1075                1080

Asn Asn  Tyr Thr Gly Thr Gln  Glu Glu Tyr Glu Gly  Thr Tyr Thr
    1085                1090                1095

Ser Arg  Asn Gln Gly Tyr Asp  Glu Ala Tyr Gly Asn  Asn Pro Ser
    1100                1105                1110

Val Pro  Ala Asp Tyr Ala Ser  Val Tyr Glu Glu Lys  Ser Tyr Thr
    1115                1120                1125

Asp Gly  Arg Arg Glu Asn Pro  Cys Glu Ser Asn Arg  Gly Tyr Gly
    1130                1135                1140

Asp Tyr  Thr Pro Leu Pro Ala  Gly Tyr Val Thr Lys  Asp Leu Glu
    1145                1150                1155

Tyr Phe  Pro Glu Thr Asp Lys  Val Trp Ile Glu Ile  Gly Glu Thr
    1160                1165                1170

Glu Gly  Thr Phe Ile Val Asp  Ser Val Glu Leu Leu  Leu Met Glu
    1175                1180                1185

Glu
```

<210>   7

<211>   3522

<212>   DNA

<213>   Bacillus thuringiensis

<400>   7
atggagaata atattcaaaa tcaatgcgta ccttacaatt gtttaaataa tcctgaagta   60

gaaatattaa atgaagaaag aagtactggc agattaccgt tagatatatc cttatcgctt   120

acacgtttcc ttttgagtga atttgttcca ggtgtgggag ttgcgtttgg attatttgat   180

ttaatatggg gttttataac tccttctgat tggagcttat ttcttttaca gattgaacaa   240

ttgattgagc aaagaataga aacattggaa aggaaccggg caattactac attacgaggg   300

ttagcagata gctatgaaat ttatattgaa gcactaagag agtgggaagc aaatcctaat   360

aatgcacaat taagggaaga tgtgcgtatt cgatttgcta atacagacga cgctttaata   420

acagcaataa ataattttac acttacaagt tttgaaatcc ctctttttatc ggtctatgtt   480

caagcggcga atttacattt atcactatta agagacgctg tatcgtttgg gcagggttgg   540

ggactggata tagctactgt taataatcat tataatagat taataaatct tattcataga   600

tatacgaaac attgtttgga cacatacaat caaggattag aaaacttaag aggtactaat   660

actcgacaat gggcaagatt caatcagttt aggagagatt taacacttac tgtattagat   720

atcgttgctc tttttccgaa ctacgatgtt agaacatatc caattcaaac gtcatcccaa   780

ttaacaaggg aaatttatac aagttcagta attgaggatt ctccagtttc tgctaatata   840

cctaatggtt ttaatagggc ggaatttgga gttagaccgc cccatcttat ggactttatg   900

aattctttgt ttgtaactgc agagactgtt agaagtcaaa ctgtgtgggg aggacactta   960

gttagttcac gaaatacggc tggtaaccgt ataaatttcc ctagttacgg ggtcttcaat   1020

cctggtggcg ccatttggat tgcagatgag gatccacgtc cttttatcg gacattatca   1080

MA-43CDF2D3

```
gatcctgttt ttgtccgagg aggatttggg aatcctcatt atgtactggg gcttagggga   1140

gtagcatttc aacaaactgg tacgaaccac acccgaacat ttagaaatag tgggaccata   1200

gattctctag atgaaatccc acctcaggat aatagtgggg caccttggaa tgattatagt   1260

catgtattaa atcatgttac atttgtacga tggccaggtg agatttcagg aagtgattca   1320

tggagagctc caatgttttc ttggacgcac cgtagtgcaa cccctacaaa tacaattgat   1380

ccggagagga ttactcaaat accattggta aaagcacata cacttcagtc aggtactact   1440

gttgtaagag ggcccgggtt tacgggagga gatattcttc gacgaacaag tggaggacca   1500

tttgcttata ctattgttaa tataaatggg caattacccc aaaggtatcg tgcaagaata   1560

cgctatgcct ctactacaaa tctaagaatt tacgtaacgg ttgcaggtga acggattttt   1620

gctggtcaat ttaacaaaac aatggatacc ggtgacccat taacattcca atcttttagt   1680

tacgcaacta ttaatacagc ttttacattc ccaatgagcc agagtagttt cacagtaggt   1740

gctgatactt ttagttcagg gaatgaagtt tatatagaca gatttgaatt gattccagtt   1800

actgcaacat ttgaagcaga atatgattta gaaagagcac aaaaggcggt gaatgcgctg   1860

tttacttcta taaaccaaat agggataaaa acagatgtga cggattatca tattgatcaa   1920

gtatccaatt tagtggattg tttatcagat gaattttgtc tggatgaaaa gcgagaattg   1980

tccgagaaag tcaaacatgc gaagcgactc agtgatgagc ggaatttact tcaagatcca   2040

aacttcaaag gcatcaatag gcaactagac cgtggttgga gaggaagtac ggatattacc   2100

atccaaagag gagatgacgt attcaaagaa aattatgtca cactaccagg tacctttgat   2160

gagtgctatc caacgtattt atatcaaaaa atagatgagt cgaaattaaa accctatact   2220

cgttatcaat taagagggta tatcgaggat agtcaagact tagaaatcta tttgatccgc   2280

tataatgcaa aacacgaaac agtaaatgtg ctaggtacgg gttctttatg ccgctttca   2340

gtccaaagtc caatcagaaa gtgtggagaa ccgaatcgat gcgcgccaca ccttgaatgg   2400

aatcctgatc tagattgttc ctgcagagac ggggaaaaat gtgcacatca ttcgcatcat   2460

ttctccttgg acattgatgt tggatgtaca gacttaaatg aggacttaga tgtatgggtg   2520

atattcaaga ttaagacgca agatggccat gcaagactag gaaatctaga gtttctcgaa   2580
```

MA-43CDF2D3

gagaaaccat tagtcgggga agcactagct cgtgtgaaaa gagcagagaa aaaatggaga   2640

gataaacgtg aaaaattgga attggaaaca aatattgttt ataaagaggc aaaagaatct   2700

gtagatgctt tatttgtaaa ctctcaatat gatcaattac aagcggatac gaatattgcc   2760

atgattcatg cggcagataa acgtgttcat agaattcggg aagcgtatct tccagagtta   2820

tctgtgattc cgggtgtaaa tgtagacatt ttcgaagaat taaaagggcg tattttcact   2880

gcattcttcc tatatgatgc gagaaatgtc attaaaaacg gtgatttcaa taatggctta   2940

tcatgctgga acgtgaaagg gcatgtagat gtagaagaac aaaacaacca ccgttcggtc   3000

cttgttgttc cggaatggga agcagaagtg tcacaagaag ttcgtgtctg tccgggtcgt   3060

ggctatatcc ttcgtgtcac agcgtacaag gagggatatg gagaaggttg cgtaaccatt   3120

catgagatcg agaacaatac agacgaactg aagtttagca actgcgtaga agaggaagtc   3180

tatccaaaca acacggtaac gtgtaatgat tatactgcaa atcaagaaga atacgggggt   3240

gcgtacactt cccgtaatcg tggatatgac gaaacttatg gaagcaattc ttctgtacca   3300

gctgattatg cgtcagtcta tgaagaaaaa tcgtatacag atggacgaag agacaatcct   3360

tgtgaatcta acagaggata tggggattac acaccactac cagctggcta tgtgacaaaa   3420

gaattagagt acttcccaga aaccgataag gtatggattg agatcggaga aacggaagga   3480

acattcatcg tggacagcgt ggaattactc cttatggagg aa   3522

<210> 8

<211> 1174

<212> PRT

<213> Bacillus thuringiensis

<400> 8

Met Glu Asn Asn Ile Gln Asn Gln Cys Val Pro Tyr Asn Cys Leu Asn
1   5   10   15

MA-43CDF2D3

Asn Pro Glu Val Glu Ile Leu Asn Glu Glu Arg Ser Thr Gly Arg Leu
            20   25   30

Pro Leu Asp Ile Ser Leu Ser Leu Thr Arg Phe Leu Leu Ser Glu Phe
            35   40   45

Val Pro Gly Val Gly Val Ala Phe Gly Leu Phe Asp Leu Ile Trp Gly
            50   55   60

Phe Ile Thr Pro Ser Asp Trp Ser Leu Phe Leu Leu Gln Ile Glu Gln
65   70   75   80

Leu Ile Glu Gln Arg Ile Glu Thr Leu Glu Arg Asn Arg Ala Ile Thr
                85   90   95

Thr Leu Arg Gly Leu Ala Asp Ser Tyr Glu Ile Tyr Ile Glu Ala Leu
            100   105   110

Arg Glu Trp Glu Ala Asn Pro Asn Asn Ala Gln Leu Arg Glu Asp Val
            115   120   125

Arg Ile Arg Phe Ala Asn Thr Asp Asp Ala Leu Ile Thr Ala Ile Asn
            130   135   140

Asn Phe Thr Leu Thr Ser Phe Glu Ile Pro Leu Leu Ser Val Tyr Val
145   150   155   160

Gln Ala Ala Asn Leu His Leu Ser Leu Leu Arg Asp Ala Val Ser Phe
                165   170   175

Gly Gln Gly Trp Gly Leu Asp Ile Ala Thr Val Asn Asn His Tyr Asn
            180   185   190

Arg Leu Ile Asn Leu Ile His Arg Tyr Thr Lys His Cys Leu Asp Thr
            195   200   205

Tyr Asn Gln Gly Leu Glu Asn Leu Arg Gly Thr Asn Thr Arg Gln Trp
    210   215   220

Ala Arg Phe Asn Gln Phe Arg Arg Asp Leu Thr Leu Thr Val Leu Asp
225   230   235   240

Ile Val Ala Leu Phe Pro Asn Tyr Asp Val Arg Thr Tyr Pro Ile Gln
            245   .   250   255

Thr Ser Ser Gln Leu Thr Arg Glu Ile Tyr Thr Ser Ser Val Ile Glu
            260   265   270

```
Asp Ser Pro Val Ser Ala Asn Ile Pro Asn Gly Phe Asn Arg Ala Glu
        275             280             285

Phe Gly Val Arg Pro Pro His Leu Met Asp Phe Met Asn Ser Leu Phe
        290             295             300

Val Thr Ala Glu Thr Val Arg Ser Gln Thr Val Trp Gly Gly His Leu
305             310             315             320

Val Ser Ser Arg Asn Thr Ala Gly Asn Arg Ile Asn Phe Pro Ser Tyr
            325             330             335

Gly Val Phe Asn Pro Gly Gly Ala Ile Trp Ile Ala Asp Glu Asp Pro
        340             345             350

Arg Pro Phe Tyr Arg Thr Leu Ser Asp Pro Val Phe Val Arg Gly Gly
        355             360             365

Phe Gly Asn Pro His Tyr Val Leu Gly Leu Arg Gly Val Ala Phe Gln
    370             375             380

Gln Thr Gly Thr Asn His Thr Arg Thr Phe Arg Asn Ser Gly Thr Ile
385             390             395             400

Asp Ser Leu Asp Glu Ile Pro Pro Gln Asp Asn Ser Gly Ala Pro Trp
            405             410             415

Asn Asp Tyr Ser His Val Leu Asn His Val Thr Phe Val Arg Trp Pro
            420             425             430

Gly Glu Ile Ser Gly Ser Asp Ser Trp Arg Ala Pro Met Phe Ser Trp
            435             440             445

Thr His Arg Ser Ala Thr Pro Thr Asn Thr Ile Asp Pro Glu Arg Ile
    450             455             460

Thr Gln Ile Pro Leu Val Lys Ala His Thr Leu Gln Ser Gly Thr Thr
465             470             475             480

Val Val Arg Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu Arg Arg Thr
            485             490             495

Ser Gly Gly Pro Phe Ala Tyr Thr Ile Val Asn Ile Asn Gly Gln Leu
            500             505             510

Pro Gln Arg Tyr Arg Ala Arg Ile Arg Tyr Ala Ser Thr Thr Asn Leu
        515             520             525
```

MA-43CDF2D3

Arg Ile Tyr Val Thr Val Ala Gly Glu Arg Ile Phe Ala Gly Gln Phe
    530   535   540

Asn Lys Thr Met Asp Thr Gly Asp Pro Leu Thr Phe Gln Ser Phe Ser
545   550   555   560

Tyr Ala Thr Ile Asn Thr Ala Phe Thr Phe Pro Met Ser Gln Ser Ser
                565   570   575

Phe Thr Val Gly Ala Asp Thr Phe Ser Ser Gly Asn Glu Val Tyr Ile
            580   585   590

Asp Arg Phe Glu Leu Ile Pro Val Thr Ala Thr Phe Glu Ala Glu Tyr
        595   600   605

Asp Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ile
    610   615   620

Asn Gln Ile Gly Ile Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln
625   630   635   640

Val Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu
                645   650   655

Lys Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp
            660   665   670

Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Lys Gly Ile Asn Arg Gln
        675   680   685

Leu Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Arg Gly
    690   695   700

Asp Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Phe Asp
705   710   715   720

Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu
            725   730   735

Lys Pro Tyr Thr Arg Tyr Gln Leu Arg Gly Tyr Ile Glu Asp Ser Gln
            740   745   750

Asp Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Thr Val
        755   760   765

Asn Val Leu Gly Thr Gly Ser Leu Trp Pro Leu Ser Val Gln Ser Pro
    770   775   780

```
Ile Arg Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp
785             790         795             800

Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His
            805             810             815

His Ser His His Phe Ser Leu Asp Ile Asp Val Gly Cys Thr Asp Leu
            820             825             830

Asn Glu Asp Leu Asp Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp
            835             840             845

Gly His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu
        850             855             860

Val Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg
865             870             875             880

Asp Lys Arg Glu Lys Leu Glu Leu Glu Thr Asn Ile Val Tyr Lys Glu
                885             890             895

Ala Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Gln
            900             905             910

Leu Gln Ala Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg
        915             920             925

Val His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro
    930             935             940

Gly Val Asn Val Asp Ile Phe Glu Glu Leu Lys Gly Arg Ile Phe Thr
945             950             955             960

Ala Phe Phe Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe
            965             970             975

Asn Asn Gly Leu Ser Cys Trp Asn Val Lys Gly His Val Asp Val Glu
        980             985             990

Glu Gln Asn Asn His Arg Ser Val Leu Val Val Pro Glu Trp Glu Ala
        995             1000            1005

Glu Val Ser Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile
    1010            1015            1020

Leu Arg Val Thr Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val
    1025            1030            1035
```

MA-43CDF2D3

```
Thr Ile  His Glu Ile Glu Asn  Asn Thr Asp Glu Leu  Lys Phe Ser
    1040              1045              1050

Asn Cys  Val Glu Glu Glu Val  Tyr Pro Asn Asn Thr  Val Thr Cys
    1055              1060              1065

Asn Asp  Tyr Thr Ala Asn Gln  Glu Glu Tyr Gly Gly  Ala Tyr Thr
    1070              1075              1080

Ser Arg  Asn Arg Gly Tyr Asp  Glu Thr Tyr Gly Ser  Asn Ser Ser
    1085              1090              1095

Val Pro  Ala Asp Tyr Ala Ser  Val Tyr Glu Glu Lys  Ser Tyr Thr
    1100              1105              1110

Asp Gly  Arg Arg Asp Asn Pro  Cys Glu Ser Asn Arg  Gly Tyr Gly
    1115              1120              1125

Asp Tyr  Thr Pro Leu Pro Ala  Gly Tyr Val Thr Lys  Glu Leu Glu
    1130              1135              1140

Tyr Phe  Pro Glu Thr Asp Lys  Val Trp Ile Glu Ile  Gly Glu Thr
    1145              1150              1155

Glu Gly  Thr Phe Ile Val Asp  Ser Val Glu Leu Leu  Leu Met Glu
    1160              1165              1170

Glu
```